

CLAIMS :

1. A method in a data processing system for managing cached data, the method comprising:

responsive to initiating a write operation on the data block, sending a message to all other data processing systems identified in the directory of data blocks as containing a copy of the data block to reset the flag such that the flag indicates that the data in the data block is invalid without requiring any action by the other data processing systems receiving the message.

3. The method of claim 1, wherein the data block is a page.

4. A method in a data processing system for managing a plurality of caches of data, wherein the data processing system includes a plurality of processors, the method comprising:

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dedicating a processor within the plurality of processors for polling for request messages from other data processing systems;

responsive to initiating a read operation to read
 5 data on a data block, posting an indication on a directory of data blocks identifying the read operation by the data processing system; and

responsive to initiating a write operation on the data block, sending a message to all of the other data
 10 processing systems that the data block is invalid.

5. The method of claim 4 further comprising:
 obtaining a lock on a data block;

determining whether a copy of the data block is present within a local cache; and

15 responsive to a copy of the data block being absent from the local cache, checking a validity of the data block in the buffer.

6. The method of claim 4 further comprising:

providing a lock table, wherein the lock table
 20 contains data identifying the data processing system and a location of a validity flag in which the validity flag indicates whether the data block is valid.

7. The method of claim 4, wherein the data block is a page.

25 8. The method of claim 4, wherein the message initiates an invalidation of the data block.

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9. A method in a data processing system for managing data in a distributed buffer system, the method comprising:

- identifying an operation to access the data;
- 5 determining whether a copy of the data is present locally within the data processing system;
- responsive to the copy of the data being present locally within the data processing system, checking an indicator for the data to determine whether the copy of
- 10 the data is valid; and
- responsive to the data being valid, accessing the copy of the data.
10. The method of claim 9 further comprising:
- 15 responsive to an absence of a copy of the data being present locally within the data processing system, copying the data into the data processing system; and
- setting an indicator to indicate that the data copied into the data processing system is valid.
- 20 11. The method of claim 9 further comprising:
- responsive to the accessing being a write access, obtaining identification of all nodes having containing the data to form a set of identified nodes; and
- setting indicators in the set of identified nodes to
- 25 indicate that the data is invalid in the set of identified nodes.
12. The method of claim 11, wherein the set of nodes is a set of data processing systems.

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13. The method of claim 9, wherein the data processing system includes a plurality of processors and wherein the method is a set of instructions executed by one of the plurality of processors.

5 14. The method of claim 9, wherein the data is a page.

15. The method of claim 9, wherein the operation is read operation.

16. The method of claim 9, wherein the operation is a write operation.

10 17. A data processing system comprising:
a bus system;
a communications unit connected to the bus system;
a memory connected to the bus system, wherein the
memory includes a set of instructions; and
15 a processing unit connected to the bus system,
wherein the processing unit executes the set of
instructions to, place an indication on a directory of
data blocks identifying the data processing system as
containing a copy of a data block with a location in the
20 data processing system in which a flag associated the
data block is located in response to initiating a read
operation on the block of data; and send a message to all
other data processing systems identified in the directory
of data blocks as containing a copy of the data block to
25 reset the flag such that the flag indicates that the data
in the data block is invalid without requiring any action

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by the other data processing systems receiving the message in response to initiating a write operation on the data block.

18. A data processing system comprising:

- 5 a bus system;
 a communications unit connected to the bus system;
 a memory connected to the bus system, wherein the memory includes a set of instructions; and
 a processing unit connected to the bus system,
10 wherein the processing unit executes the set of instructions to dedicate a processor within the plurality of processors for polling for request messages from other data processing systems; post an indication on a directory of data blocks identifying the read operation
15 by the data processing system in response to initiating a read operation to read data on a data block; and send a message to all of the other data processing systems that the data block is invalid to remove the data block from the directory of data blocks in response to initiating a
20 write operation on the data block.

19. A data processing system comprising:

- a bus system;
 a communications unit connected to the bus system;
 a memory connected to the bus system, wherein the
25 memory includes a set of instructions; and
 a processing unit connected to the bus system,
 wherein the processing unit executes the set of instructions to identify an operation to access the data; determine whether a copy of the data is present locally
30 within the data processing system; check an indicator for

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- 5 20. A data processing system for managing cached data,
the data processing system comprising:
- placing means, responsive to initiating a read
operation on a block of data, for placing an indication
on a directory of data blocks identifying the data
10 processing system as containing a copy of the data block
with a location in the data processing system in which a
flag associated the data block is located; and
- sending means, responsive to initiating a write
operation on the data block, for sending a message to all
15 other data processing systems identified in the directory
of data blocks as containing a copy of the data block to
reset the flag such that the flag indicates that the data
in the data block is invalid without requiring any action
by the other data processing systems receiving the
20 message.
21. The data processing system of claim 20, wherein the
directory of data blocks is located in at least one of
the data processing system and the other data processing
systems.
- 25 22. The data processing system of claim 20, wherein the
data block is a page.

23. A data processing system for managing a plurality of caches of data, wherein the data processing system includes a plurality of processors, the data processing system comprising:

posting means, responsive to initiating a read operation to read data on a data block, for posting an indication on a directory of data blocks identifying the read operation by the data processing system; and

24. The data processing system of claim 23 further comprising:

determining means for determining whether a copy of the data block is present within a local cache; and

25. The data processing system of clam 23 further comprising:

providing means for providing a lock table, wherein
the lock table contains data identifying the data
30 processing system and a location of a validity flag in

which the validity flag indicates whether the data block is valid.

5 27. The data processing system of claim 23, wherein the message initiates an invalidation of the data block.

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10     identifying means for identifying an operation to
    access the data;

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15 checking means, responsive to the copy of the data
being present locally within the data processing system,
for checking an indicator for the data to determine
whether the copy of the data is valid; and

29. The data processing system of claim 28 further comprising:

copying means, responsive to an absence of a copy of
25 the data being present locally within the data processing
system, for copying the data into the data processing
system; and

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setting means for setting an indicator to indicate that the data copied into the data processing system is valid.

30. The data processing system of claim 28 further
5 comprising:

obtaining means, responsive to the accessing being a write access, for obtaining identification of all nodes having containing the data to form a set of identified nodes; and

10 setting means for setting indicators in the set of identified nodes to indicate that the data is invalid in the set of identified nodes.

31. The data processing system of claim 30, wherein the set of nodes is a set of data processing systems.

15 32. The data processing system of claim 28, wherein the data processing system includes a plurality of processors and wherein the method is a set of instructions executed by one of the plurality of processors.

20 33. The data processing system of claim 28, wherein the data is a page.

34. The data processing system of claim 28, wherein the operation is read operation.

35. The data processing system of claim 28, wherein the operation is a write operation.

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36. A computer program product in a computer readable medium for managing a plurality of caches data, the computer program product comprising:

- first instructions, responsive to initiating a read
5 operation on a block of data, for placing an indication on a directory of data blocks identifying the data processing system as containing a copy of the data block with a location in the data processing system in which a flag associated the data block is located; and
10 second instructions, responsive to initiating a write operation on the data block, for sending a message to all other data processing systems identified in the directory of data blocks as containing a copy of the data block to reset the flag such that the flag indicates that
15 the data in the data block is invalid without requiring any action by the other data processing systems receiving the message.

37. A computer program product in a computer readable medium for managing a plurality of caches of data,
20 wherein the data processing system includes a plurality of processors, the computer program product comprising:

- first instructions for dedicating a processor within the plurality of processors for polling for request messages from other data processing systems;
25 second instructions, responsive to initiating a read operation to read data on a data block, for posting an indication on a directory of data blocks identifying the read operation by the data processing system; and
third instructions, responsive to initiating a write
30 operation on the data block, for sending a message to all of the other data processing systems that the data block

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is invalid to remove the data block from the directory of data blocks.

5 the computer program product comprising:

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        second instructions for determining whether a copy
of the data is present locally within the data processing
10  system;

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15 fourth instructions, responsive to the data being
valid, for accessing the copy of the data.